

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F21-R-45

Survey Location: Rapid Creek

County: Pennington

Survey Dates: May 31 – August 6, 2013

INTRODUCTION

Rapid Creek is the largest stream in the Black Hills of western South Dakota. Its watershed supplies municipal water to the city of Rapid City and other surrounding communities. It is also an important stream for anglers and has two dams on it creating Pactola Reservoir and Canyon Lake, which are also important for many forms of recreation.

The Rapid Creek watershed begins with its headwaters north and west of the town of Rochford and with the Castle Creek forks located south of Deerfield Reservoir. Castle Creek runs through Deerfield Reservoir and enters Rapid Creek near Mystic. Rapid Creek runs east through Pactola Reservoir, Canyon Lake, and Rapid City before entering the Cheyenne River about 13 miles east of Farmingdale. The upper Rapid Creek watershed is located in a pine/spruce forest which is largely managed by the United States Forest Service.

Although Rapid Creek is highly regulated by dams at Deerfield and Pactola reservoirs, Rapid Creek, like most streams in the Black Hills, experienced drastic changes in flow over the past 15 years. The area above Pactola Reservoir is affected by flows coming out of Deerfield Reservoir into Castle Creek and by runoff from the upper part of the watershed. The lower part of Rapid Creek is mostly affected by flows coming out of Pactola Reservoir, which is regulated by the Bureau of Reclamation. Most of western South Dakota experienced moderate to severe drought from 2002 to 2008 (US Drought Monitor 2009), followed by four years of above average moisture, and in 2012, lower than average moisture. Mean annual flow was as high as 140 cfs in 1997, as low as 23 cfs in 2008, and back up to 92 cfs in 2011. This included daily flows over 400 cfs in 1996, as low as 12 in 2008, over 300 cfs in 2010, and again over 400 cfs in 2011 (Figure 1). These drastically variable flow events likely changed fish populations and habitat throughout Rapid Creek.

Another concern for Rapid Creek fish populations is the invasive exotic diatom, *Didymosphenia geminata* (Didymo) that was discovered in 2002. By 2004 large mats of Didymo were present in the creek and generated complaints about esthetics, and water quality. Around the same time a decline in the trout population and a change in population structure became apparent. Thereafter, research began to determine the relationship between Didymo and the trout population (James and Chipps 2010, James et.al. 2010a, James et.al 2010b).

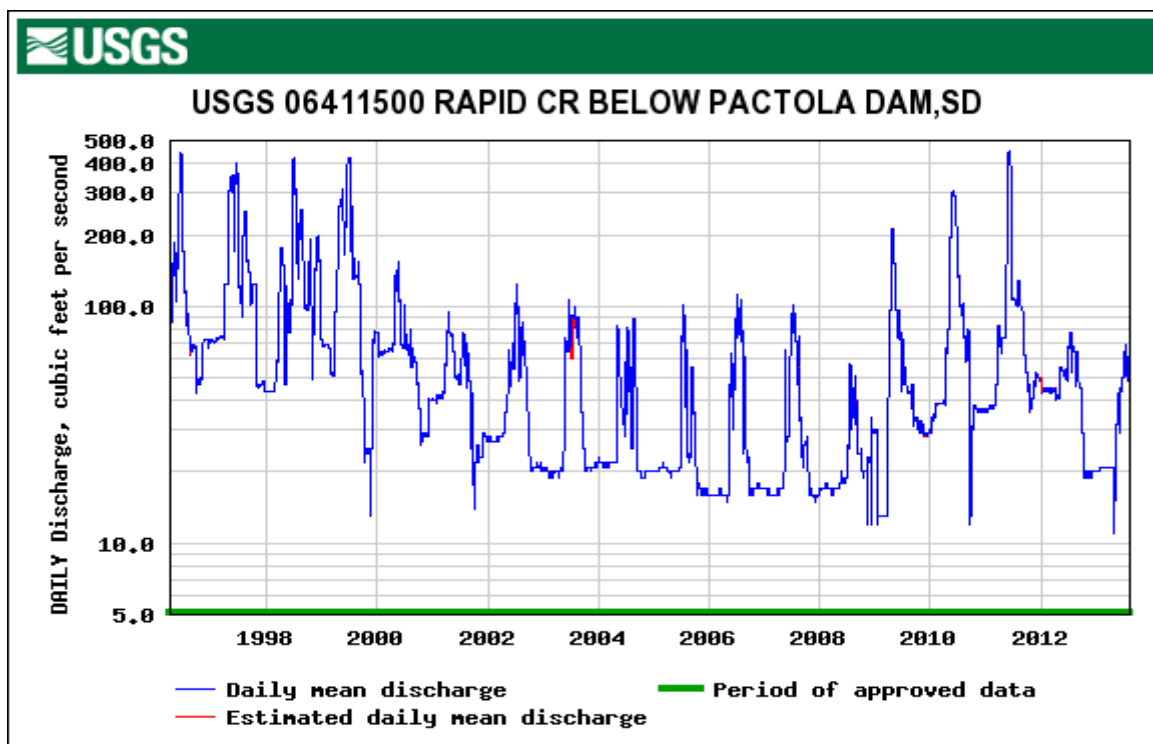


Figure 1: Daily discharge (CFS) of Rapid Creek below Pactola Reservoir in 1996-2013.

The majority of Rapid Creek and its tributaries are managed as a wild trout (natural yield) fishery with a daily limit of five trout (in any combination) with one allowed 14 inches or longer. Two areas of Rapid Creek are managed with a catch and release, no organic bait regulation for all trout. These are: 1) a two-mile stretch from the footbridge at Placerville Church Camp to Pactola Dam, including the stilling basin, and 2) the area in Rapid City from Jackson Boulevard upstream through the Meadowbrook Golf Course to Park Drive.

Two areas of Rapid Creek are managed with catchable Rainbow Trout stockings. One of these is from Braeburn Park (above Cleghorn Fish Hatchery) upstream to the United States Geologic Survey gaging station. This area receives monthly stockings of 125 catchable (11 inch) Rainbow Trout from May through August. The other area is from Silver City (above Pactola) upstream into the walk-in-fishery with five catchable Rainbow Trout stockings of 300 11-inch fish and 15 15-inch fish from April to August.

SURVEY METHODS

Rapid Creek Site Selection

Prior to an intense survey in 2012, the main stem of Rapid Creek was divided into five segments (Figure 2) based on morphologic, hydrologic, or management characteristics. Each segment was assigned a specific number of 100 m reaches to be sampled based on length of the segment and management importance. Due to private property access issues and morphology with frequent deep pools, most sites were selected because they had been sampled in the past. Sites were numbered based on their distance, in 100 meters, above the confluence with the Cheyenne River. For the 2013 survey 2-4 sites from the 2012 survey were chosen per segment. Segment 1 included most of Rapid City from the low-head dam at the Central States

Fairgrounds 9.3 km to Canyon Lake. Three sample reaches were selected for Segment 1 including a site in the Meadowbrook Golf Course catch and release area. Segment 2 was from Canyon Lake upstream 35.3 km to the walking bridge at Placerville Church Camp. This large segment includes a loss zone with little water flow and a large distance that is difficult to access between Dark Canyon and Hisega. Four sample reaches were selected for Segment 2. Segment 3 was within the catch and release area from Placerville Church Camp to the Pactola Reservoir stilling basin. Three sample reaches were selected here. Segment 3 is typically characterized by the highest flows in Rapid Creek and also some of the highest angling pressure in the Black Hills. Segment 4 was from the inlet of Pactola Reservoir up to the confluence with Castle Creek near the town of Mystic. Two reaches were selected in Segment 4. Segment 4 receives flows from Castle Creek, which is the largest tributary of Rapid Creek. Segment 5 was from Castle Creek to the confluence of the North and South Forks of Rapid Creek near the town of Rochford. Two reaches were sampled here. In 2013 this area was characterized by low flows and much narrower stream widths than the rest of Rapid Creek.

Sample Methods

Efforts were made to satisfy the assumptions 1) the population is static, 2) capture probability remains constant across sampling periods, and 3) all fish in the population are equally vulnerable to capture (Van Den Avyle and Hayward 1999; Hayes et al. 2007). Block nets at the upstream and downstream boundaries were used to prevent fish from emigrating or immigrating within the sample site. Three passes were generally made with one, two, or three backpack electrofishing units (depending on stream width), and captured fish were removed and held in holding cages between passes until processing. For all sites, captured fish were anesthetized with carbon dioxide (made by mixing glacial acetic acid and baking soda in water), measured to the nearest millimeter (mm) total length, weighed to the nearest gram (g). Fish were then held in recovery cages and returned to the stream after recovery. When 50 individual lengths and weights were collected from small fish (<100 mm) of a specific species, bulk counts were collected to expedite data collection. Data was entered into Coldstream Database. The Coldstream Database was used to calculate parameters such as population estimates of fish per 100 meters and estimated numbers of fish per acre. Calculations are based on depletion of fish numbers in each pass, and the catchability of fish within each site.

In addition to fish data, pH, temperature, and specific conductance were measured and recorded. Stream widths were measured every ten meters and averaged to obtain an estimate of total area sampled.

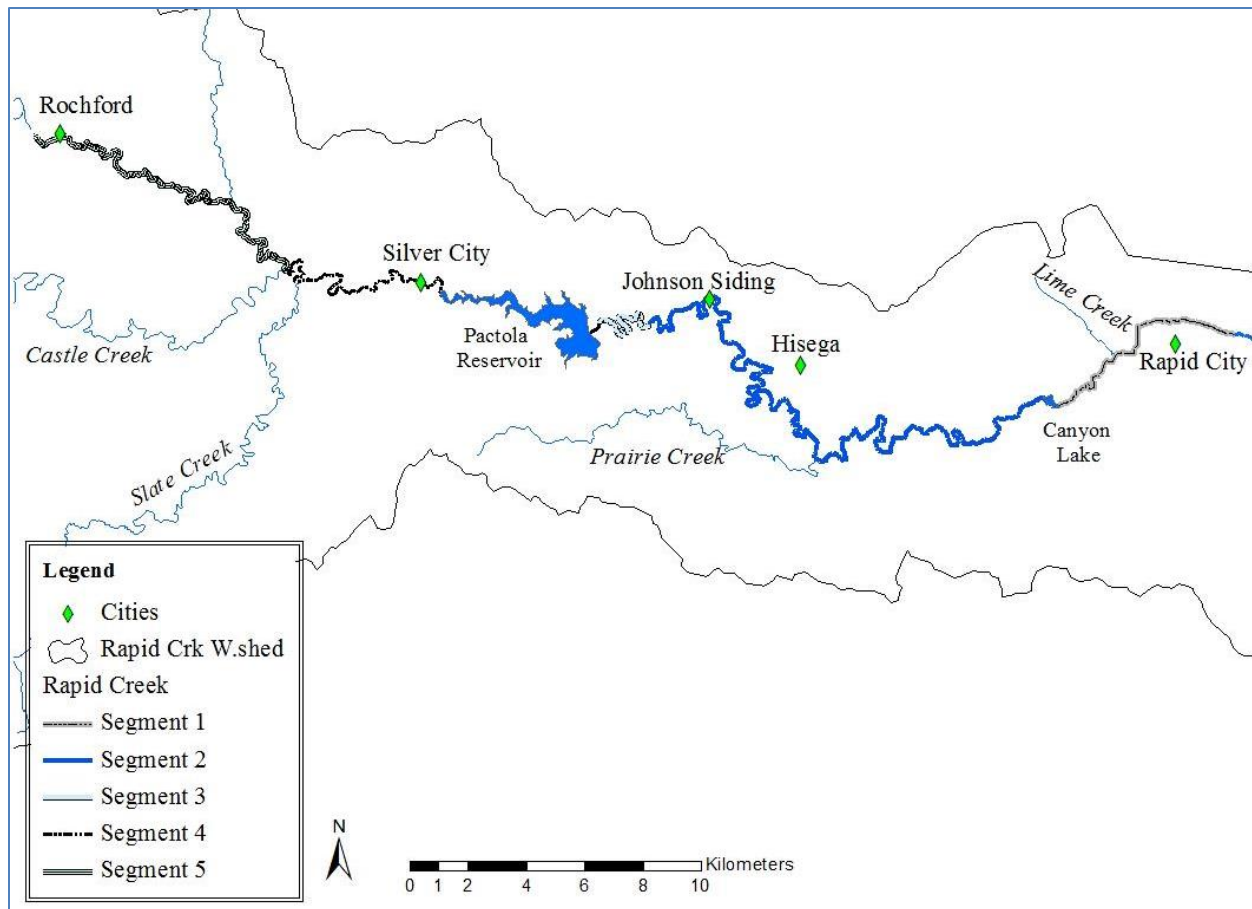


Figure 2. Map of Rapid Creek Watershed with sample segments and tributary streams of Rapid Creek delineated.

Table 1. Sample reaches, (100 m), in Rapid Creek, South Dakota that were surveyed during 2013. Reaches are listed by segment, site reach number, approximate location, and abbreviation in parenthesis.

Segment	Reach	Location
1	1369	Near the Civic Center at 6 th St. in Rapid City (Civic Center)
1	1407	By Sioux Park Swimming Pool in Rapid City (Sioux Park)
1	1431	Meadowbrook Golf course: downstream of proshop (Meadowbrook)
2	1456	Upstream from Cleghorn Hatchery Visitor Center (Cleghorn Upstream)
2	1642	Downstream of Hisega (Hisega)
2	1741	Johnson Siding off South Creekview Rd. (Johnson Siding)
2	1801	Below Dam at Placerville Church Camp (Placerville Downstream)
3	1821	Old flume trestle: 2,100 m below Pactola Basin (Flume Trestle)
3	1832	Lower parking lot 1,000 m below Pactola Basin (Basin New Channel)
3	1837	Above the footbridge 500 m below Pactola Basin (Basin Foot Bridge)
4	1947	At the start of the Silver City walk-in area (Silver City)
4	1962	1,500 m up Silver City walk-in near an old trestle bridge (S.C. Trestle)
5	2093	Rochford Road just below Mystic Road (Mystic)
5	2155	Rochford Road at Bloody Gulch (Bloody Gulch)

RESULTS AND DISCUSSION

Eight species of fish were sampled in Rapid Creek in 2013 with the majority being trout. Brown Trout (*Salmo trutta*) were the most abundant in every segment and Rainbow Trout (*Oncorhynchus mykiss*) were surveyed in all five segments. Brook Trout (*Salvelinus fontinalis*) were surveyed in Segments 3, 4, and 5 with no individuals >200 mm captured. They will not be discussed in further detail. Other species were found in low densities and included Creek Chub (*Semotilus atromaculatus*), Longnose Dace (*Rhinichthys cataractae*), White Sucker (*Catostomus commersonii*), Rock Bass (*Ambloplites rupestris*), Mountain Sucker (*Catostomus platyrhynchus*), and Bluegill (*Lepomis macrochirus*). Most of these non-trout species occur near the reservoirs located on Rapid Creek. Mountain Sucker is found in segment 5 above the Castle Creek confluence. It is a native species of greatest conservation need in South Dakota and is discussed further by Belica and Nibbelink (2006) and Schultz and Bertrand (2012). No further discussion will be made about non-trout species due to their low abundances. Because few reaches were sampled in 2013, results will not be extrapolated to the rest of that stream segment.

Summary by species

Brown Trout

Population estimates for Brown Trout varied by sample reach and stream segment (**Error! Reference source not found.**). Total density estimates of Brown Trout were highest in Segment 1 and declined with upstream progression through segment 4. Five sites had densities of Brown Trout high enough to meet the Class 1 Brown Trout standards (≥ 150 fish ≥ 200 mm/surface acre; Erickson et al. 1993). This included all of the reaches in segment 1, site 1456 in segment 2, and site 2093 in segment 5. The rest of the sample reaches were high enough to meet the Class 2 Brown Trout classification (25-150 fish ≥ 200 mm per acre). Brown Trout smaller than 200 mm were most abundant at site 1741 (Johnson Siding) and 1837 (Basin Foot Bridge) with estimates higher than 200 fish/100 m.

Segment 1 had the highest abundance of fish greater than 200 mm with individual sites ranging from 43 to 172 fish/100 m or 166-750 fish/acre (Table 2). The highest abundance occurred at site 1407 (Behind Sioux Park Swimming Pool). Estimates of abundance were comparable to the results during the 2012 survey with site 1369 (Civic Center) being almost identical, site 1407 (Sioux Park) being slightly higher, and site 1431 (Meadowbrook) slightly lower. Segment 1 also exhibited the highest abundance of fish greater than 300 mm with 19 fish/100 m in the two upstream sites.

Table 2. Estimated population (number/100 m) and density (number/acre) of Brown Trout in sample reaches of Rapid Creek Segment 1, (within Rapid City). Results from the 2012 and 2013 surveys are included.

Reach	2013				2012			
	<200 mm per 100 m	≥ 200 mm per 100 m	≥ 200 mm per acre	≥ 300 mm per 100 m	<200 mm per 100 m	≥ 200 mm per 100 m	≥ 200 mm per acre	≥ 300 mm per 100 m
1369	121	43	166	9	128	44	159	10
1407	101	172	750	19	210	131	528	15
1431	189	65	236	19	160	84	329	21

Segment 2 had intermediate abundances of fish ≥ 200 mm. Abundance in 2013 declined with upstream progression and individual reaches ranged from 12 to 34 fish/100 m or 50-178 fish/acre. When compared to the 2012 survey abundance was similar for site 1642 (Hisega) and lower for the other three sites. This could be due to higher flow in 2013 with fish spread out over a greater area and reduced catchability. Abundance of preferred size fish (≥ 300 mm) was about the same as in 2012.

Table 3. Estimated population (number/100 m) and density (number/acre) of Brown Trout in sample reaches of Rapid Creek segment 2, (Canyon Lake to Placerville). Results from the 2012 and 2013 surveys are included.

Reach	2013				2012			
	<200 mm per 100 m	≥ 200 mm per 100 m	≥ 200 mm per acre	≥ 300 mm per 100 m	<200 mm per 100 m	≥ 200 mm per 100 m	≥ 200 mm per acre	≥ 300 mm per 100 m
1456	84	34	178	9	335*	58	275	12
1642	186	22	107	1	169	28	127	3
1741	255	16	60	10	89	30	104	10
1801	156	12	50	5	164	60	245	6

*sample exhibited high confidence intervals due to lack of subsequent pass regression.

Segment 3 is under a catch and release regulation and receives a lot of angler attention. Abundance of Brown Trout ≥ 200 mm was greatest at the lowest site (1821 Flume Trestle) and was less than $\frac{1}{2}$ as much in the other two sites (Table 4). When compared to the 2012 survey, sites 1821 and 1837 (Basin Foot Bridge) had lower abundance and density and site 1832 (Basin New Channel) had higher abundance and density. All three sites had lower abundance of small Brown Trout less than 200 mm. Sites 1821 and 1832 had higher abundance of preferred size fish (>300 mm). During a survey in 1999, this segment had an average estimate as high as 335 fish greater than 200 mm per acre.

Table 4. Estimated population (number/100 m) and density (number/acre) of Brown Trout in sample reaches of Rapid Creek segment 3, (Placerville to Pactola Basin). Results from the 2012 and 2013 surveys are included.

Reach	2013				2012			
	<200 mm per 100 m	≥ 200 mm per 100 m	≥ 200 mm per acre	≥ 300 mm per 100 m	<200 mm per 100 m	≥ 200 mm per 100 m	≥ 200 mm per acre	≥ 300 mm per 100 m
1821	74	30	123	20	440	47	193	13
1832	83	12	52	11	102	8	34	3
1837	275	12	54	10	314	22	81	10

Decreases in the total biomass ($>50\%$) of Brown Trout in Rapid Creek during an extended drought period from 2000-2007 (U.S. Drought Monitor 2010) have been documented (James, D. A. et. al 2010a). This is also apparent in the decline in abundance of adult Brown Trout (≥ 200 mm) that occurred during this time as well (Tables 5, Table 6, Table 7). This decline occurred at the same time that Didymo was thriving in Rapid Creek between Canyon Lake and Pactola Reservoir. The 2012 survey may indicate a slight improvement in the fishery since the drought with increases in abundance (≥ 200 mm/100 m) in Segments 1, 2 and 3. The 2013 survey,

although limited, had similar results to 2012. Sites in Segments 4 and 5 were not previously surveyed extensively so comparisons were not made.

Table 5. Average population (number/100 m) and density (number/acre) estimates of Brown Trout by length (mm) in Segment 1 of Rapid Creek (within Rapid City) during 2000-2013 surveys.

Month/Year	Number of sites	<200 mm/ 100 m	≥200 mm/ 100 m	≥200 mm/ acre	≥300 mm/ 100 m
10/2000	9	250	201	793	14
10/2001	9	143	169	678	11
10/2002	8	218	128	527	14
9/2005	5	212	46	210	16
7/2012	6	150	89	345	19
7/2013	3	108	93	384	16

Table 6. Average population (number/100 m) and density (number/acre) estimates of Brown Trout by length (mm) in Segment 2 of Rapid Creek (Canyon Lake to Placerville Walking Bridge) during 2000-2013 surveys.

Month/Year	Number of sites	<200 mm/ 100 m	≥200 mm/ 100 m	≥200 mm/ acre	≥300 mm/ 100 m
10/2000	7	369	30	132	9
10/2001	7	503	21	102	11
10/2002	7	398	11	47	3
9/2005	4	249	11	44	4
7/2012	9	156	46	181	7
6-8/2013	4	170	21	99	6

Table 7. Average population (number/100 m) and density (number/acre) estimates of Brown Trout by length (mm) in Segment 3 of Rapid Creek (catch and release area from Placerville Church Camp to Pactola Reservoir Basin) during 2002-2013 surveys.

Month/Year	Number of sites	<200 mm/ 100 m	≥200 mm/ 100 m	≥200 mm/ acre	≥300 mm/ 100 m
10/2002	3	61	34	165	22
10/2005	3	424	8	33	5
10/2006	4	238	4	16	2
10/2007	4	281	9	38	3
7/2012	5	218	28	113	7
5-8/2013	3	144	18	76	14

Rainbow Trout

Rainbow Trout were sampled in every segment of Rapid Creek except Segment 5. In Segment 1 only one individual was surveyed at Site 1431 (Meadowbrook Golf Course). In 2012, 50 individuals <80 mm were sampled there.

In Segment 2 Rainbow Trout were sampled at the lowest site, 1456 (Behind Cleghorn), at a rate of 68/acre \geq 200 mm. This area receives monthly stockings of catchable Rainbow Trout from May to July and most fish sampled were around 300 mm. Site 1801 (Placerville Downstream) also had Rainbow Trout with 15 individuals <200 mm sampled. The 2012 survey yielded similar abundance at site 1456 and lower numbers of small fish at site 1801.

Segment 3 also contained low numbers of Rainbow Trout with a few individuals caught in all three sites. This is similar to the 2012 survey. Segment 4 contained the greatest abundance of Rainbow Trout ranging from 14 to 41 fish greater than 200 mm per 100 m for an average of 137 fish/acre. This would be classified as a Class I Rainbow Trout fishery except that these are likely stocked fish and not wild populations. All but one Rainbow Trout was 240-350 mm in length with the majority around 300 mm.

RECOMMENDATIONS

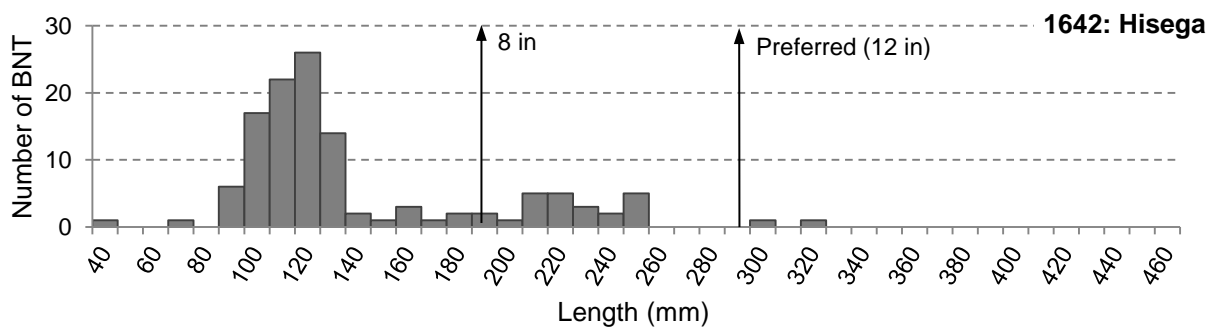
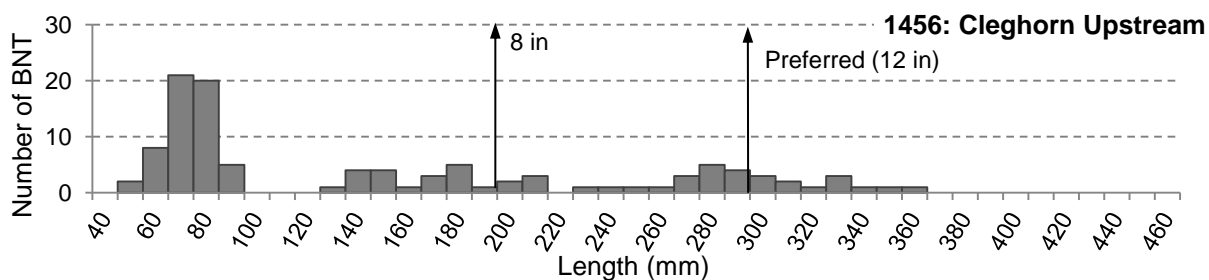
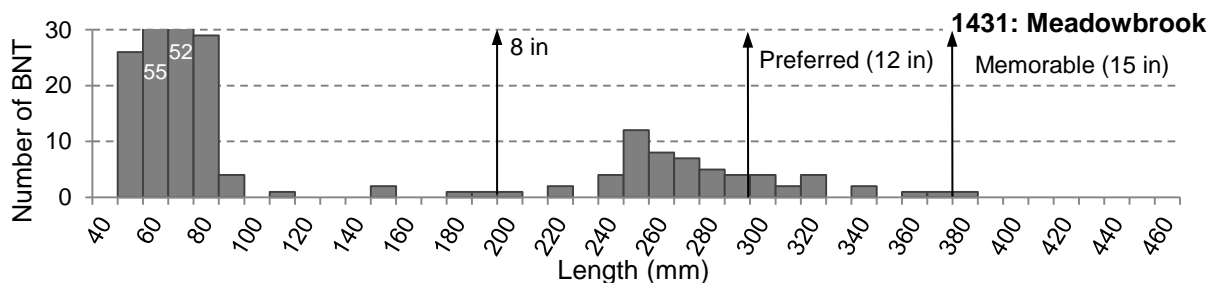
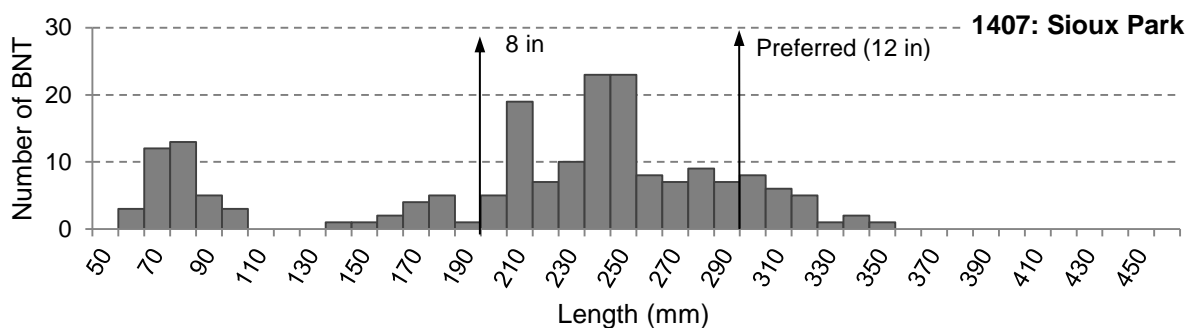
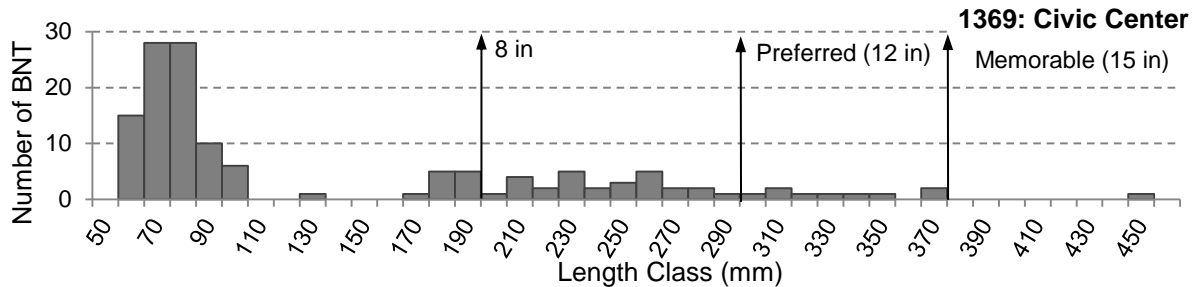
1. Continue to manage the majority of Rapid Creek as wild Brown Trout (natural yield) fisheries with a daily limit of five trout (in any combination) and one allowed 14 inches or longer.
2. Continue managing the section of Rapid Creek between Park Drive and Jackson Blvd and the area between Placerville Church Camp walking bridge and Pactola Dam with catch-and-release regulations.
3. Continue regular spring and summer stocking of catchable Rainbow Trout above Canyon Lake and above Pactola Reservoir.
4. Perform intensive population surveys in Rapid Creek every three to five years and sample a few sites per segment every year for long term monitoring.

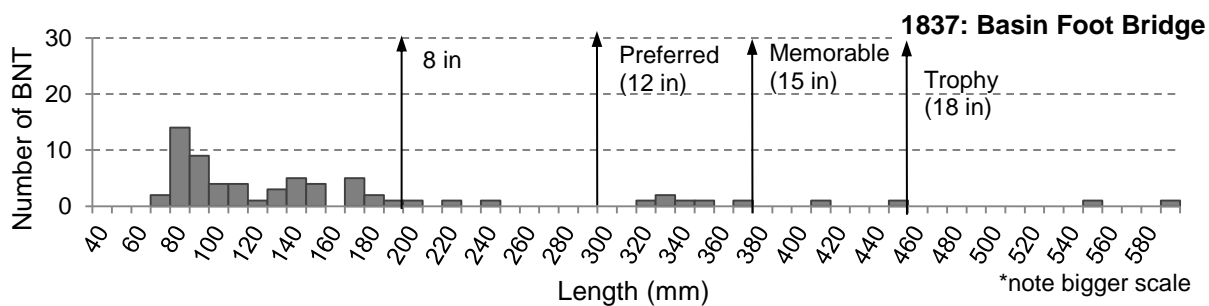
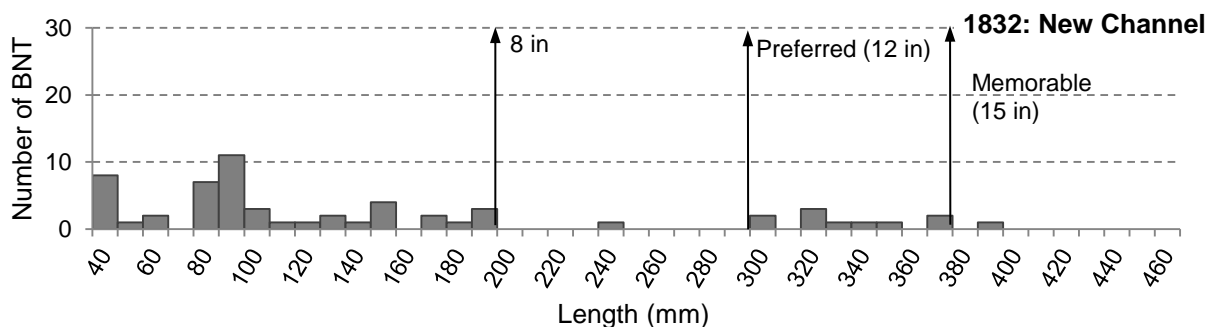
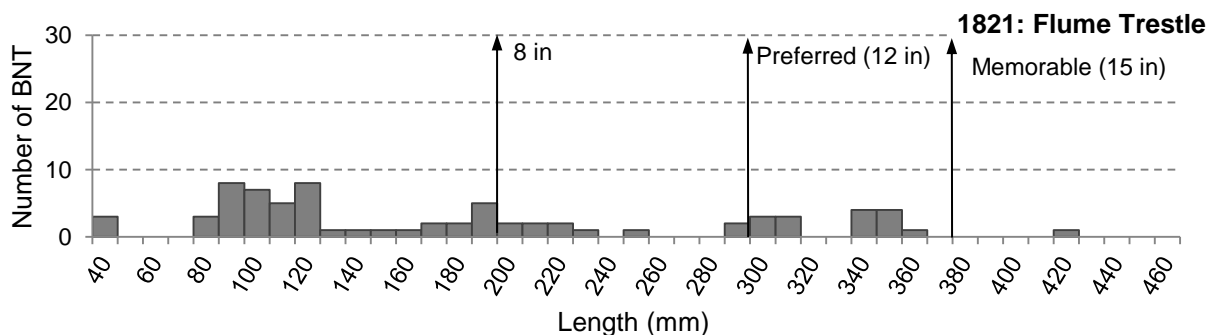
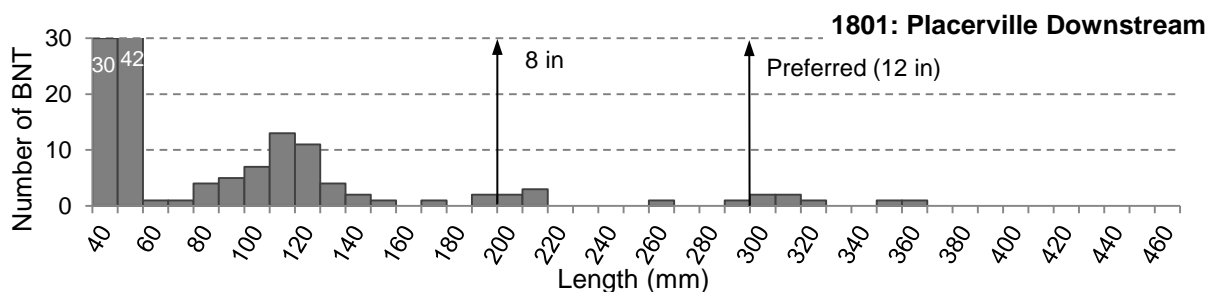
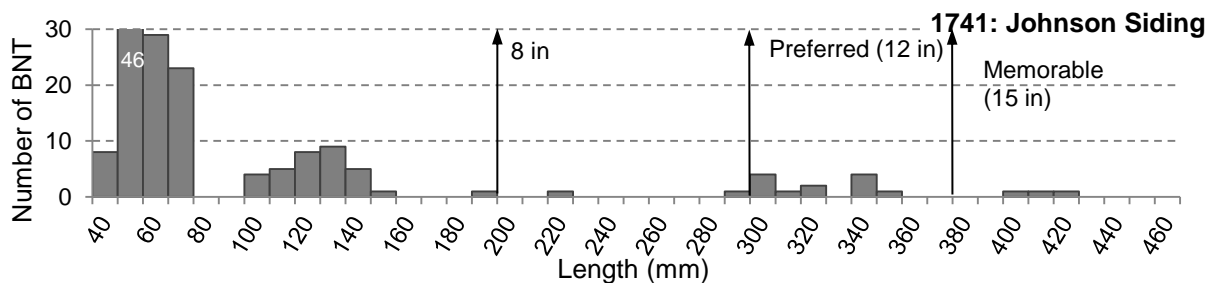
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APPENDIX I: Length-frequency histogram for Brown Trout captured during the 2013 survey of Rapid Creek. Results are presented by site number.





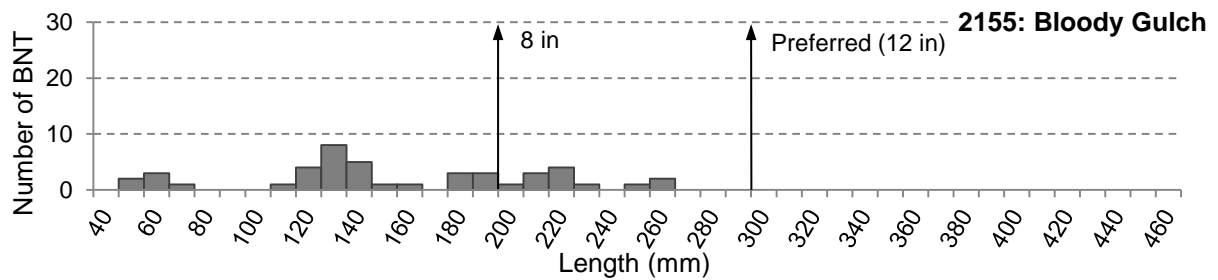
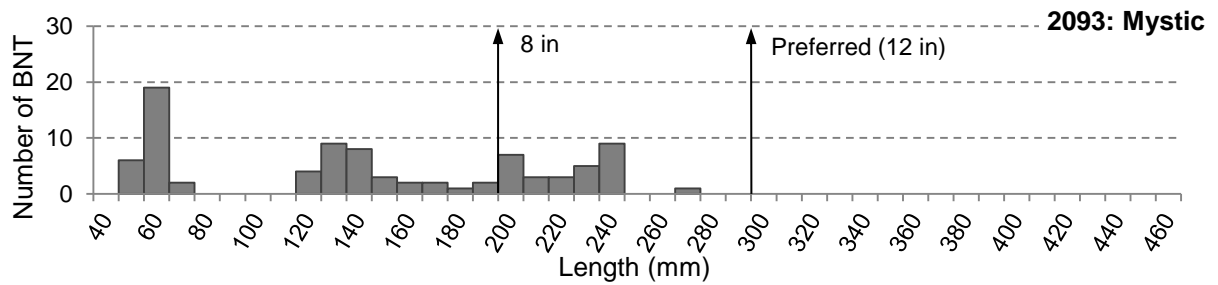
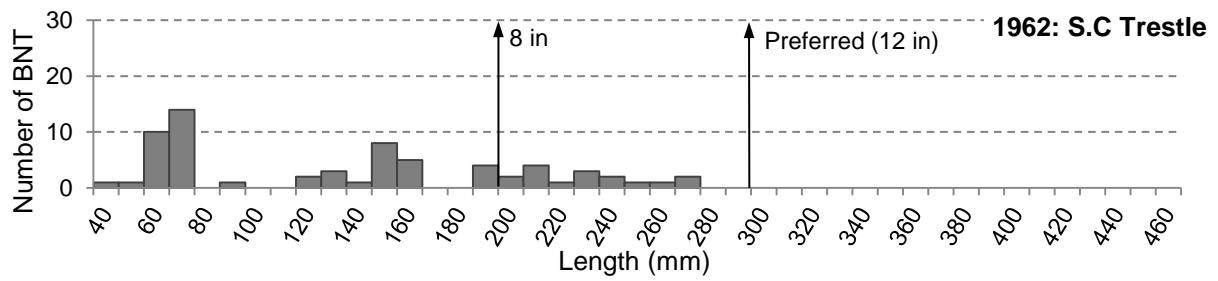
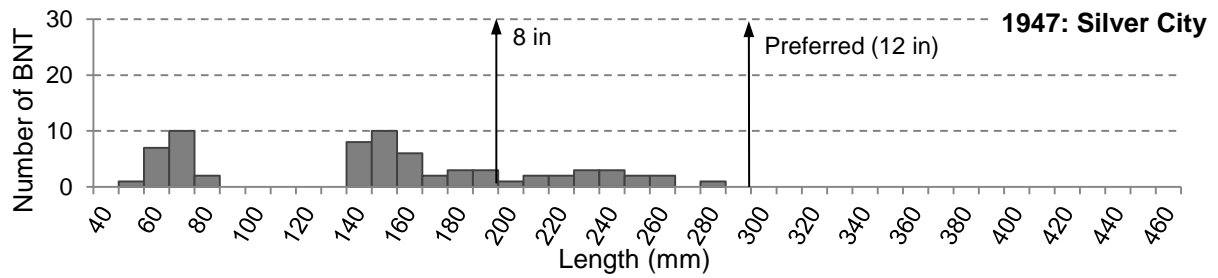


Table 1. Population and Biomass Estimates for Rapid Creek.

Site Number: 1369 Survey Completed by: South Dakota Game, Fish and Parks
 Site Description: Civic Center (6th St. Bridge) (site 27)
 Legal Description: S36,R7E,T2N
 Stream Classification: BNT1

Date Sampled: 30 JUL 2013 Conductivity (µmhos): 484
 Site Length (m): 100 pH: ****
 Mean Width (m): 10.5 Water Temperature (°C): 18.8
 Number of Passes: 3 Air Temperature (°C): ****

Species	Size Class	Total Number Captured	Est. # in site	Lower 95% CI	Upper 95% CI	# per hectare	Kg per hectare	# per Km	# per acre	lb. per acre	# per mile	Mean Length (mm)	Mean Weight (grams)	Mean Fulton K-factor
Bluegill	ALL	1	1	1	5	10	***	10	4	***	16	55.0	***	***
Brown Trout	<200 mm	100	121	100	144	1,156	38.63	1,210	468	34.49	1,947	85.0	33.4	1.12
Brown Trout	≥200 mm	36	43	36	56	411	84.52	430	166	75.46	692	268.0	205.7	0.97
Brown Trout	ALL	136	166	138	194	1,586	209.16	1,660	643	186.75	2,671	133.4	131.8	1.03
Longnose Dace	ALL	6	30	6	428	287	1.72	300	116	1.54	483	42.7	6.0	0.85
White Sucker	ALL	6	6	6	8	57	0.63	60	23	0.56	97	62.8	11.0	1.01

Site Number: 1407 Survey Completed by:
 Site Description: Behind Sioux Park Swimming Pool downstream from Sheridan Lake Drive (site 3)
 Legal Description: S3,R7E,T1N
 Stream Classification: BNT1

Date Sampled: 29 JUL 2013 Conductivity (µmhos): ****
 Site Length (m): 100 pH: ****
 Mean Width (m): 9.3 Water Temperature (°C): ****
 Number of Passes: 3 Air Temperature (°C): ****

Species	Size Class	Total Number Captured	Est. # in site	Lower 95% CI	Upper 95% CI	# per hectare	Kg per hectare	# per Km	# per acre	lb. per acre	# per mile	Mean Length (mm)	Mean Weight (grams)	Mean Fulton K-factor
Brown Trout	<200 mm	54	97	54	177	1,044	56.59	970	423	50.52	1,561	103.7	54.2	53.69
Brown Trout	≥200 mm	139	172	142	202	1,851	305.63	1,720	750	272.89	2,767	250.5	165.1	1.07
Brown Trout	ALL	194	259	208	310	2,788	421.34	2,590	1,129	376.20	4,167	209.4	151.1	7.69

Population and Biomass Estimates for Rapid Creek. (Continued)

Site Number: 1431 Survey Completed by: South Dakota Game, Fish and Parks
 Site Description: Downstream of Meadowbrook Golf Course Pro Shop (site 22)
 Legal Description: S9,R7E,T1N
 Stream Classification: BNT1 RBT2

Date Sampled: 30 JUL 2013 Conductivity (µmhos): 363
 Site Length (m): 100 pH: ****
 Mean Width (m): 11.1 Water Temperature (°C): 19.0
 Number of Passes: 3 Air Temperature (°C): ****

Species	Size Class	Total Number Captured	Est. # in site	Lower 95% CI	Upper 95% CI	# per hectare	Kg per hectare	# per Km	# per acre	lb. per acre	# per mile	Mean Length (mm)	Mean Weight (grams)	Mean Fulton K-factor
Brown Trout	<200 mm	171	189	173	205	1,696	47.48	1,890	687	42.39	3,041	72.8	28.0	1.26
Brown Trout	≥200 mm	57	65	57	77	583	132.90	650	236	118.66	1,046	281.6	227.9	0.99
Brown Trout	ALL	228	255	235	275	2,288	436.44	2,550	927	389.68	4,103	125.0	190.8	1.04
Green Sunfish	ALL	1	1	1	2	9	0.49	10	4	0.44	16	143.0	55.0	1.88
Longnose Dace	ALL	2	2	2	2	18	***	20	7	***	32	62.0	***	***
Rainbow Trout	≥200 mm	1	1	1	1	9	1.70	10	4	1.51	16	260.0	189.0	1.08
Rainbow Trout	ALL	1	1	1	1	9	1.70	10	4	1.51	16	260.0	189.0	1.08
White Sucker	ALL	3	3	3	4	27	***	30	11	***	48	44.3	***	***

Site Number: 1456 Survey Completed by:
 Site Description: Just upstream of Cleghorn Visitor Center (site 30)
 Legal Description: S8,R7E,T1N
 Stream Classification: BNT1 RBT1

Date Sampled: 29 JUL 2013 Conductivity (µmhos): 359
 Site Length (m): 100 pH: ****
 Mean Width (m): 7.7 Water Temperature (°C): 18.5
 Number of Passes: 3 Air Temperature (°C): ****

Species	Size Class	Total Number Captured	Est. # in site	Lower 95% CI	Upper 95% CI	# per hectare	Kg per hectare	# per Km	# per acre	lb. per acre	# per mile	Mean Length (mm)	Mean Weight (grams)	Mean Fulton K-factor
Brown Trout	<200 mm	76	84	76	95	1,088	43.84	840	441	39.15	1,352	92.3	40.3	1.02
Brown Trout	≥200 mm	32	34	32	39	441	97.45	340	178	87.01	547	278.0	221.2	0.97
Brown Trout	ALL	108	119	108	131	1,542	230.54	1,190	624	205.85	1,915	147.3	149.5	0.99
Rainbow Trout	<200 mm	3	3	3	3	39	***	30	16	***	48	69.7	***	***
Rainbow Trout	≥200 mm	12	13	12	18	168	41.38	130	68	36.95	209	290.5	245.7	0.98
Rainbow Trout	ALL	15	15	15	17	194	47.74	150	79	42.63	241	246.3	245.7	0.98
White Sucker	ALL	4	4	4	5	52	22.78	40	21	20.34	64	331.8	439.5	1.17

Population and Biomass Estimates for Rapid Creek. (Continued)

Site Number: 1642 Survey Completed by:
 Site Description: Hisega (stream improvement area) (site 13)
 Legal Description: S9,R6E,T1N
 Stream Classification: BNT2

Date Sampled: 04 JUN 2013 Conductivity (µmhos): 399
 Site Length (m): 100 pH: 8.3
 Mean Width (m): 8.3 Water Temperature (°C): 12.3
 Number of Passes: 3 Air Temperature (°C): ****

Species	Size Class	Total Number Captured	Est. # in site	Lower 95% CI	Upper 95% CI	# per hectare	Kg per hectare	# per Km	# per acre	lb. per acre	# per mile	Mean Length (mm)	Mean Weight (grams)	Mean Fulton K-factor
Brown Trout	<200 mm	99	186	99	310	2,234	40.07	1,860	905	35.78	2,993	114.1	17.9	1.08
Brown Trout	≥200 mm	22	22	22	23	264	33.72	220	107	30.11	354	230.7	127.6	1.01
Brown Trout	ALL	121	172	121	225	2,066	78.59	1,720	837	70.17	2,767	135.3	38.1	1.06

Site Number: 1741 Survey Completed by:
 Site Description: Below Johnson Siding- (1984 site 25) (site 16)
 Legal Description: S5,R6E,T1N
 Stream Classification: BNT2 RBT2

Date Sampled: 07 AUG 2013 Conductivity (µmhos): ****
 Site Length (m): 100 pH: ****
 Mean Width (m): 10.7 Water Temperature (°C): ****
 Number of Passes: 3 Air Temperature (°C): ****

Species	Size Class	Total Number Captured	Est. # in site	Lower 95% CI	Upper 95% CI	# per hectare	Kg per hectare	# per Km	# per acre	lb. per acre	# per mile	Mean Length (mm)	Mean Weight (grams)	Mean Fulton K-factor
Brown Trout	<200 mm	119	255	119	453	2,377	53.03	2,550	963	47.35	4,103	74.2	22.3	1.15
Brown Trout	≥200 mm	16	16	16	17	149	51.56	160	60	46.04	257	319.9	345.7	1.00
Brown Trout	ALL	135	213	135	295	1,986	272.60	2,130	804	243.40	3,427	103.3	137.3	1.10
Rainbow Trout	≥200 mm	1	1	1	1	9	6.97	10	4	6.23	16	408.0	748.0	1.10
Rainbow Trout	ALL	1	1	1	1	9	6.97	10	4	6.23	16	408.0	748.0	1.10

Population and Biomass Estimates for Rapid Creek. (Continued)

Site Number: 1801 Survey Completed by:
 Site Description: 1801-Below Placerville Church Camp dam (site 17)
 Legal Description: S1,R5E,T1N
 Stream Classification: BNT2 RBT0

Date Sampled: 04 AUG 2013 Conductivity (µmhos): ****
 Site Length (m): 100 pH: ****
 Mean Width (m): 9.8 Water Temperature (°C): ****
 Number of Passes: 3 Air Temperature (°C): ****

Species	Size Class	Total Number Captured	Est. # in site	Lower 95% CI	Upper 95% CI	# per hectare	Kg per hectare	# per Km	# per acre	lb. per acre	# per mile	Mean Length (mm)	Mean Weight (grams)	Mean Fulton K-factor
Brown Trout	<200 mm	126	156	127	185	1,590	35.64	1,560	644	31.83	2,510	77.3	22.4	1.12
Brown Trout	≥200 mm	12	12	12	13	122	29.50	120	50	26.34	193	281.3	241.2	1.00
Brown Trout	ALL	138	167	141	193	1,703	115.21	1,670	690	102.87	2,687	95.0	67.7	1.09
Rainbow Trout	<200 mm	15	15	15	16	153	2.41	150	62	2.16	241	106.7	15.8	1.15
Rainbow Trout	ALL	15	15	15	16	153	2.41	150	62	2.16	241	106.7	15.8	1.15

Site Number: 1821 Survey Completed by:
 Site Description: Pactola Basin (Flume Trestle) (site 14)
 Legal Description: S2,R5E,T1N
 Stream Classification: BKT0 BNT2 RBT2

Date Sampled: 31 JUL 2013 Conductivity (µmhos): 362
 Site Length (m): 100 pH: ****
 Mean Width (m): 9.9 Water Temperature (°C): 9.5
 Number of Passes: 3 Air Temperature (°C): ****

Species	Size Class	Total Number Captured	Est. # in site	Lower 95% CI	Upper 95% CI	# per hectare	Kg per hectare	# per Km	# per acre	lb. per acre	# per mile	Mean Length (mm)	Mean Weight (grams)	Mean Fulton K-factor
Brook Trout	<200 mm	3	3	3	4	30	0.67	30	12	0.59	48	99.7	22.0	1.00
Brook Trout	ALL	3	3	3	4	30	0.67	30	12	0.59	48	99.7	22.0	1.00
Brown Trout	<200 mm	49	74	49	117	746	21.81	740	302	19.48	1,191	117.4	29.2	1.22
Brown Trout	≥200 mm	30	30	30	32	302	97.51	300	123	87.06	483	304.1	322.4	1.06
Brown Trout	ALL	79	95	79	114	958	144.99	950	388	129.46	1,529	188.3	151.4	1.15
Rainbow Trout	<200 mm	5	5	5	7	50	1.54	50	20	1.37	80	116.0	30.5	1.26
Rainbow Trout	≥200 mm	3	3	3	4	30	8.90	30	12	7.95	48	294.7	294.3	1.03
Rainbow Trout	ALL	8	8	8	10	81	11.58	80	33	10.34	129	183.0	143.6	1.16

Population and Biomass Estimates for Rapid Creek. (Continued)

Site Number: 1832 Survey Completed by:
 Site Description: Pactola Basin (new channel) (site 8)
 Legal Description: S2,R5E,T1N
 Stream Classification: BKT0 BNT2 RBT2

Date Sampled: 06 AUG 2013 Conductivity (µmhos): ****
 Site Length (m): 100 pH: ****
 Mean Width (m): 9.3 Water Temperature (°C): ****
 Number of Passes: 3 Air Temperature (°C): ****

Species	Size Class	Total Number Captured	Est. # in site	Lower 95% CI	Upper 95% CI	# per hectare	Kg per hectare	# per Km	# per acre	lb. per acre	# per mile	Mean Length (mm)	Mean Weight (grams)	Mean Fulton K-factor
Brook Trout	<200 mm	2	2	2	2	21	0.33	20	9	0.30	32	111.0	15.5	1.13
Brook Trout	ALL	2	2	2	2	21	0.33	20	9	0.30	32	111.0	15.5	1.13
Brown Trout	<200 mm	56	83	56	126	891	37.91	830	361	33.84	1,335	92.6	42.6	1.12
Brown Trout	≥200 mm	12	12	12	13	129	46.94	120	52	41.91	193	332.8	364.5	0.96
Brown Trout	ALL	68	88	68	115	944	161.81	880	382	144.47	1,416	135.0	171.3	1.06
Rainbow Trout	<200 mm	8	8	8	10	86	3.50	80	35	3.12	129	117.3	40.8	1.04
Rainbow Trout	≥200 mm	2	2	2	3	21	5.20	20	9	4.65	32	288.5	242.5	1.01
Rainbow Trout	ALL	10	10	10	12	107	11.59	100	43	10.35	161	151.5	108.0	1.03

Site Number: 1837 Survey Completed by:
 Site Description: Above foot bridge between Sites 8 and 9 in Catch and Release reach (site 26)
 Legal Description: S2,R5E,T1N
 Stream Classification: BNT2 RBT0

Date Sampled: 31 MAY 2013 Conductivity (µmhos): 39
 Site Length (m): 100 pH: 8.3
 Mean Width (m): 9.0 Water Temperature (°C): 6.5
 Number of Passes: 4 Air Temperature (°C): ****

Species	Size Class	Total Number Captured	Est. # in site	Lower 95% CI	Upper 95% CI	# per hectare	Kg per hectare	# per Km	# per acre	lb. per acre	# per mile	Mean Length (mm)	Mean Weight (grams)	Mean Fulton K-factor
Brown Trout	<200 mm	55	275	55	1,364	3,052	100.50	2,750	1,236	89.73	4,425	109.7	32.9	1.03
Brown Trout	≥200 mm	12	12	12	12	133	74.04	120	54	66.11	193	374.8	555.8	0.93
Brown Trout	ALL	67	335	67	1,508	3,718	736.45	3,350	1,506	657.56	5,390	157.2	198.1	1.00
Rainbow Trout	<200 mm	8	9	8	15	100	4.70	90	40	4.19	145	100.5	47.0	1.00
Rainbow Trout	ALL	8	9	8	15	100	4.70	90	40	4.19	145	100.5	47.0	1.00

Population and Biomass Estimates for Rapid Creek. (Continued)

Site Number: 1947 Survey Completed by:
 Site Description: Silver City Walk-in area (site 3)
 Legal Description: S31,R5E,T1N
 Stream Classification: BKT0 BNT2 RBT1

Date Sampled: 05 AUG 2013 Conductivity (µmhos): ****
 Site Length (m): 100 pH: ****
 Mean Width (m): 7.0 Water Temperature (°C): ****
 Number of Passes: 3 Air Temperature (°C): ****

Species	Size Class	Total Number Captured	Est. # in site	Lower 95% CI	Upper 95% CI	# per hectare	Kg per hectare	# per Km	# per acre	lb. per acre	# per mile	Mean Length (mm)	Mean Weight (grams)	Mean Fulton K-factor
Brook Trout	<200 mm	1	1	1	1	14	0.42	10	6	0.37	16	141.0	29.0	1.03
Brook Trout	ALL	1	1	1	1	14	0.42	10	6	0.37	16	141.0	29.0	1.03
Brown Trout	<200 mm	52	52	52	54	747	29.58	520	302	26.41	837	118.5	39.6	1.16
Brown Trout	≥200 mm	16	16	16	17	230	27.80	160	93	24.82	257	231.4	121.0	0.96
Brown Trout	ALL	68	69	68	72	991	65.06	690	401	58.09	1,110	145.1	65.7	1.09
Rainbow Trout	<200 mm	1	1	1	5	14	0.39	10	6	0.35	16	153.0	27.0	0.75
Rainbow Trout	≥200 mm	14	14	14	14	201	49.30	140	81	44.02	225	284.4	245.2	1.02
Rainbow Trout	ALL	15	15	15	16	215	49.69	150	87	44.36	241	275.6	230.7	1.00
Rock Bass	ALL	9	9	9	9	129	3.62	90	52	3.23	145	107.4	28.0	2.14
White Sucker	ALL	1	1	1	1	14	***	10	6	***	16	84.0	***	***

Site Number: 1962 Survey Completed by:
 Site Description: 1962 - Trestle at Silver City Walk In Fishery
 Legal Description: S1,R4E,T1N
 Stream Classification: BNT2 RBT1

Date Sampled: 06 AUG 2013 Conductivity (µmhos): ****
 Site Length (m): 100 pH: ****
 Mean Width (m): 8.6 Water Temperature (°C): ****
 Number of Passes: 3 Air Temperature (°C): ****

Species	Size Class	Total Number Captured	Est. # in site	Lower 95% CI	Upper 95% CI	# per hectare	Kg per hectare	# per Km	# per acre	lb. per acre	# per mile	Mean Length (mm)	Mean Weight (grams)	Mean Fulton K-factor
Brown Trout	<200 mm	52	57	52	66	661	27.38	570	268	24.45	917	104.5	41.4	1.10
Brown Trout	≥200 mm	14	14	14	16	162	19.08	140	66	17.04	225	228.2	117.5	0.96
Brown Trout	ALL	66	72	66	81	835	56.33	720	338	50.29	1,158	130.7	67.4	1.05
Rainbow Trout	≥200 mm	37	41	37	49	476	129.72	410	193	115.83	660	288.5	272.7	1.12
Rainbow Trout	ALL	37	41	37	49	476	129.72	410	193	115.83	660	288.5	272.7	1.12
Rock Bass	ALL	5	5	5	7	58	1.64	50	23	1.46	80	107.0	28.2	2.21
White Sucker	ALL	2	2	2	4	23	14.31	20	9	12.77	32	369.0	616.5	1.23

Population and Biomass Estimates for Rapid Creek. (Continued)

Site Number: 2093 Survey Completed by:
 Site Description: Immediately below Mystic Road (site 5)
 Legal Description: S28,R4E,T2N
 Stream Classification: BKT0 BNT1

Date Sampled: 01 AUG 2013 Conductivity (µmhos): ****
 Site Length (m): 100 pH: ****
 Mean Width (m): 5.3 Water Temperature (°C): ****
 Number of Passes: 3 Air Temperature (°C): ****

Species	Size Class	Total Number Captured	Est. # in site	Lower 95% CI	Upper 95% CI	# per hectare	Kg per hectare	# per Km	# per acre	lb. per acre	# per mile	Mean Length (mm)	Mean Weight (grams)	Mean Fulton K-factor
Brook Trout	<200 mm	1	1	1	1	19	0.70	10	8	0.62	16	164.0	37.0	0.84
Brook Trout	ALL	1	1	1	1	19	0.70	10	8	0.62	16	164.0	37.0	0.84
Brown Trout	<200 mm	64	68	64	75	1,285	44.88	680	521	40.07	1,094	108.7	34.9	1.00
Brown Trout	≥200 mm	23	23	23	24	435	48.97	230	176	43.72	370	228.4	112.7	0.94
Brown Trout	ALL	87	91	87	97	1,720	111.31	910	697	99.38	1,464	140.3	64.7	0.98

Site Number: 2155 Survey Completed by:
 Site Description: 2155- Bloody Gulch
 Legal Description: S00,R00E,T
 Stream Classification: BKT0 BNT2

Date Sampled: 01 AUG 2013 Conductivity (µmhos): ****
 Site Length (m): 100 pH: ****
 Mean Width (m): 5.3 Water Temperature (°C): ****
 Number of Passes: 2 Air Temperature (°C): ****

Species	Size Class	Total Number Captured	Est. # in site	Lower 95% CI	Upper 95% CI	# per hectare	Kg per hectare	# per Km	# per acre	lb. per acre	# per mile	Mean Length (mm)	Mean Weight (grams)	Mean Fulton K-factor
Brook Trout	<200 mm	1	1	1	1	19	1.35	10	8	1.21	16	186.0	72.0	1.12
Brook Trout	ALL	1	1	1	1	19	1.35	10	8	1.21	16	186.0	72.0	1.12
Brown Trout	<200 mm	33	48	33	82	903	28.38	480	366	25.34	772	125.8	31.4	0.98
Brown Trout	≥200 mm	11	16	11	37	301	30.93	160	122	27.62	257	222.2	102.8	0.92
Brown Trout	ALL	44	72	44	130	1,354	72.09	720	548	64.37	1,158	149.9	53.3	0.96
Longnose Dace	ALL	2	2	2	4	38	***	20	15	***	32	83.5	***	***
Mountain Sucker	ALL	6	7	6	14	132	8.07	70	53	7.21	113	149.0	61.3	1.53